Minutes

COMMISSION ON RESEARCH

May 8, 2019

130 Burruss Conference Room

3:30pm-5:00pm

COR Documents available to COR members in Team Drive: COR FY2018-2019

Attended:

Members: Kevin McGuire, Rajaram Bhagavathula Lijuan Yuan, Thomas Skuzinski (for Elizabeth Grant), Virginia Pannabecker, Stefan Duma, Saied Mostaghimi, Deborah Milly, Nick Brown, Sally Morton, Maria Elisa Christie, Steve Nagle, Liwu Li (for John Philips)

OVPRI: Laurel Miner, Diane Zielinski

Presenters:
Alexandra Hanlon, Professor of Practice, Department of Statistics, regarding the Center of Biostatistics and Health Data Science
Trudy Riley, Associate Vice President for Research and Innovation, Sponsored Programs

I. Approval of the Agenda
   A. S. Mostaghimi motioned, S. Duma seconded

II. Approval of April Minutes
   A. Approved via email

III. Announcements
   A. Vice Chair for 2019-2020 will be Rajaram (Raj) Bahavathula
   B. This is our last meeting for the year. Please take note of new day of the week and specific dates for 2019-2020 noted at the end of the agenda.
   C. Call for topics for COR 2019-2020 -- V. Pannabecker
      1. Suggested topics:
         a) Invite Karen DePauw to come and talk about graduate students at VT - current numbers, etc.
         b) Invite CUS Chair or other to provide an update on Software Review Committee

IV. [3:35] Unfinished Business
   A. [3:35] Report of Ongoing Activities
      1. Committee on Research Competitiveness – S. Duma

a) See Old Business

2. University Library Committee – V. Pannabecker
    a) No report
3. Faculty Senate – B. Vogelaar or B. Britt
    a) No report
4. Update to Policy 13005 – A. Michaels
    a) No report
5. Open Access Policy update – K. McGuire
    a) No report
6. Public Access to Research Data Committee -- E. Grant / R. Baghavathula
    a) Meeting held on the 24th of April
    b) Discussing how researchers deal with accessing their data; developing consensus towards committee report
7. Software review backlogs update -- V. Pannabecker
    a) Information Technologies Services and Support Committee set. Final charge shared and available in the COR May 8 2019 Meeting folder
    b) Looking for COR member to be on this committee

B. [3:45] OVPRI Update -- T. Mayer or L. Miner
    1. June 6th is new town hall - Brandi Salmon will discuss Link and Launch
    2. June 20th Trudy will speak about sponsored programs
    3. Notifying the commission of the termination of the Biocomplexity Institute; resources transferred to the Fralin Life Sciences Institute; this is a result of discussions around campus about way forward to support goal of Biocomplexity / Life Sciences on campus.

V. [3:55] Old Business

A. Report from the Committee on Research Competitiveness (CRC) (report attached in minutes) -- S. Duma
    1. Incorporated comments from COR
    2. Same overview
    3. Page 9 keeps the overall report summary and adds ‘Recommended Action Items’ -- the last action item is particularly timely related to implications of growing student population on research productivity due to teaching load, etc.
    4. Comment: College of Science conducted a survey about support for faculty startups -- this could help next year’s CRC get started on possibly conducting research on this
    5. Comment: Cost of funding graduate students; candidacy status and reduced credit hours
    6. Comment: Other costs have come up as well - difference between colleges in internal charges to Facilities and Administration (F&A) costs

VI. [4:10] New Business

A. [4:10] Center Proposal: The Center of Biostatistics and Health Data Science -- Alexandra L. Hanlon, Professor of Practice, Department of Statistics

1. Proposing a new Center of Biostatistics and Health Data Science (full proposal attached in minutes)
2. Goals
    a) Quantitative support for faculty, clinicians, and students
    b) Headquartered in Roanoke
    c) Achieve excellence through interdisciplinary collaboration
    d) This research takes place across many areas: FBRI, VTCOM, VetMed, Population Health Sciences, Neuroscience, others;
    e) Goal is to move the needle forward in Blacksburg and Roanoke
    f) CTSA - using data to improve health; data science expertise across VA; UVA, Anova, VT, Carilion; Radford
    g) Centralized biostatistics area with strong leadership
    h) Broadly interdisciplinary; Multi-disciplinary members
    i) Proposal has members listed at the time of writing, since then more have come forward, and the process will continue to evolve
    j) Expect to collaborate with external partners (faculty, staff, and students from other institutions; government, industry)
    k) Govern by stakeholder committee and advisory committee with Hanlon as Director - fiscal and administrative functions
    l) Advisory committee is optional, would help ensure cross-stakeholder input; Dean Morton, Mike Friedlander, Steve Morton, Greg Daniel, Laura Hungerford, others
    m) Appendix C describes needs, anticipated costs, funding sources for salaries, space, hardware, software, etc.
    n) Location: 4 offices & a conference room dedicated from VTCSOM in new building in Roanoke
    o) Per CTSA guidance - diverse funding portfolio
    p) Connection to SAIG - works closely with Jen Van Mullekolm (sp?) - share administrative support, want to align so that more of the health research q's come to the new Center and non-health go through SAIG; want a student flow w/interns and cooperative workflow; standing meetings weekly
    q) Comment:
        (1) Important topic; Center for transformative health behaviors would be a good collaboration opportunity; Hanlon has met them and will be a fellow in that center
    r) Motion to approve the center proposal
        (1) S. Duman motioned, S. Mostaghimi seconded
        (2) Approved by unanimous vote

B. [4:30] Presentation & Discussion -- Trudy Riley, Associate Vice President for Research and Innovation, Sponsored Programs
    1. Started in January
    2. Slides attached in minutes
    3. Premier Research Institution - what is needed?
    4. Office of Sponsored Programs (OSP) - 'facilitate not regulate' - comply w/regulations, but support researchers in doing so and in being successful in proposals, etc.
    5. OSP - provide expertise to be a conduit to sponsors, and help manage and further research portfolio at VT
    6. Continuous professional development of staff in OSP, and provide professional development for others around campus (staff, researchers)
    7. Build teams within OSP and between OSP and partners on campus
    8. SUMMIT proposal system - will be documenting steps and process here so faculty and OSP will know where things are at
    9. Within the next couple of months will be able to roll out OSP Post Awards system access to staff across campus; will be an inclusive dashboard that will include compliance needs, and more. After staff have trained and used this, the third step is to roll this out as a Principle Investigator (PI) Dashboard. Interested in what faculty would like from a system like this - one, reliable system to go to as a PI; will show compliance needs (such as if you need renewal of IRB protocol, etc.)
    10. Banner - future goals - projections
    11. Developing contract team - have 4 open full time FTE positions
    12. Will be looking at new faculty hires to gauge direction OSP needs to take in growing staff
    13. OSP staff will be looking to engage more across campus
    14. What is the best way for OSP to share information with PIs and Faculty? Want to be able to let people know what they need, without being overly burdensome
    15. Questions and Comments
        a) Q: What is the greatest need in OSP? A: Contracts team - hiring. Also, there are ways to look at efficiencies that may drive changes with the teams
        b) Comment: Elsewhere have talked about a distributed model, can you talk more about this? A: There are currently some distributed groups that are working very well for large proposals, interested in understanding that more. New goal: look to see if it could be helpful to have main award person for a certain area spend weekly or other regular time in that area; OSP is interested in OSP staff learning more about what research is being done so they see the results of their work → let Trudy know if you are willing to partner towards this

VII. [5:00] Adjournment

***Please take note of the 2019-2020 meetings listed below** which will all take place in Burruss Hall 130, from 3:30-5:00 pm, on the **2nd Thursday of each month** (with a few exceptions to accommodate academic year events or breaks)

2019
Sept. 12
Oct. 10
Nov. 7
Dec. 5

2020
Jan. – no meeting
Feb. 6
March 5
April 9
May 7

Charter

CENTER FOR BIOSTATISTICS AND HEALTH DATA SCIENCE

Prepared by:

Alexandra L. Hanlon, PhD

College of Science

Department of Statistics

May 1, 2019

Table of Contents

Overview and Background

This document serves as the official Charter for the Center for Biostatistics and Health Data Science (CBHDS). By providing a strong statistical and quantitative support base for faculty, researchers, clinicians, and students, the CBHDS is critical for expanding Virginia Tech's health- and medically-related research agenda. Such research at Virginia Tech takes place within and across a variety of organizations, including:

- Fralin Biomedical Research Institute (https://research.vtc.vt.edu)
- Virginia Tech Carilion School of Medicine (http://medicine.vtc.vt.edu/) and its health care system partner, Carilion Clinic (www.carilionclinic.org/research)
- Virginia-Maryland College of Veterinary Medicine (www.vetmed.vt.edu/), including the Department of Population Health Sciences (http://mph.vetmed.vt.edu/index.html)
- Virginia Tech College of Science (www.science.vt.edu/), including the Department of Statistics (www.stat.vt.edu/) and the School of Neuroscience (www.neuroscience.vt.edu/)

CBHDS is a Virginia Tech College of Science entity headquartered in Roanoke. The establishment of the center coincides with the broader vision to strengthen and escalate quantitative research in Roanoke, as described below.

- The university has established various "destination areas," including Data and Decisions (www.provost.vt.edu/destination-areas/da-overview/da-data.html). Within the Data and Decisions destination area, there is an emphasis on biostatistics and data science.
- Building on current facilities in Roanoke that include Carilion Clinic, Fralin Biomedical Research Institute, and the Virginia Tech Carilion School of Medicine, Virginia Tech has established a Health Sciences and Technology Innovation District (http://vtnews.vt.edu/articles/2016/03/bov-hstdistrict.html; http://www.roanoke.com/business/news/blacksburg/focus-on-innovation-virginia-tech-andcarilion-to-build-research/article_42387869-cb74-55e6-b7c3-c660150708f6.html; http://vtnews.vt.edu/articles/2016/08/bov-vtcvote.html).
- In 2018, the Virginia General Assembly approved $46.7 million in state funding — to be matched by $21 million from Virginia Tech and Carilion Clinic — to construct a 105,000 square-foot facility to expand health sciences and technology research and training assets in Roanoke. Construction of the new building should be complete by summer 2020, and will provide dedicated space for biostatistics and data science research, including four offices and a conference room, along with a clinical facility for translational veterinary oncology.
- The Virginia Tech Carilion School of Medicine—a unique partnership between a public research university (Virginia Tech) and a private health care provider (Carilion Clinic)—is a fully accredited, private four-year medical school. The school is among the first of the new generation of research-oriented medical schools in the United States. In Fall 2019, it became the ninth Virginia Tech college

(http://www.roanoke.com/business/columns_and_blogs/blogs/med_beat/vtc-medicalschool-to-become-a-college-of-virginia-tech/article_b980516a-4bcd-5d97-bc17-1a05448f005d.html; http://www.collegiatetimes.com/news/board-of-visitors approvesintegration-of-carilion-into-a-college/article_1c0758fc-6ef4-11e6-916cd706582f7081.html). The school's charter class entered in August 2010, with each class averaging 42 students. The curriculum is divided into four domains: basic science, clinical science, interprofessionalism, and research. Students are required to complete a research project of publishable quality before graduation; students work closely with biostatisticians to design and execute these projects.

- In February 2019, the integrated Translational Health Research Institute of Virginia (iTHRIV) was awarded a five-year grant of nearly $23 million from the National Institutes of Health (NIH), under the Clinical and Translational Science Awards (CTSA) mechanism, to advance innovative ideas from the point of discovery to implementation in clinical practice and population health. iTHRIV includes the University of Virginia, Inova Health System, Virginia Tech, and Carilion Clinic as partners, with the Center for Open Science and UVA's Licensing & Ventures Group as affiliates. The focus of iTHRIV is "using data to improve health" and leverages the data science expertise across the state. Drs. Alexandra Hanlon and Sally Morton are co-leaders, along with Sarah Ratcliffe of UVA, of the iTHRIV Research Methods Core, whose mission is to develop and implement high quality research tools and methods, such that all projects remain inside regulatory boundaries without hindering progress. The primary aim of the Research Methods Core is to provide comprehensive support in research design, conduct, and education. The creation of CBHDS is in direct alignment with this mission and goal. (https://vtnews.vt.edu/articles/2019/03/iThriv-fralinbiomed-030519.html)
- CTSA guidance (Welty et al, 2013) emphasizes the need for integrated research teams in academic health centers to support clinical and translational research and evidence-based medicine. They describe the need for biostatisticians to play a key role on such teams, particularly with the increasing complexity and quantity of electronic health-related data from various sources. They conclude that a centralized biostatistics collaborative unit, with strong leadership, has clear advantages over a dispersed model for long-term success and to accomplish the research and education missions of academic health centers, to both investigators, as well as to the biostatisticians themselves. The CTSA guidance papers referenced herein form the basis for planning the CBHDS infrastructure and business model.

Vision and Objectives

The mission of the CBHDS is to achieve excellence in Virginia Tech's health- and medically-related research portfolio through fostering collaborations across biostatistics, data science, health analytics, computer science, engineering, bioinformatics, biology, database management and integration, project coordination, clinical practice, health economics, translation and public policy. To achieve this mission, CBHDS seeks to:

i. Identify, integrate and coordinate expertise and resources pertinent to the areas of biostatistics, statistics, health analytics, data science, epidemiology, data management, informatics, health economics, etc to provide a central support hub for health- and medically-related research;
ii. Promote the use and awareness of appropriate contemporary analytic methods in health- and medically-related research projects;
iii. Provide training and mentorship to statisticians, analysts, and data scientists relative to communication and collaboration with biomedical and health researchers;
iv. Through effective interdisciplinary collaboration, gain an understanding of disease etiologies, adopt effective treatment and prevention strategies, and positively impact mental and physical health and quality of life.

Members and Clientele

i. Members of CBHDS will be multi- and inter-disciplinary from the Virginia Tech College of Science Departments of Statistics, including the Statistical Applications and Innovations Group (SAIG), Biological Sciences and Chemistry; Virginia-Maryland College of Veterinary Medicine Department of Population Health Sciences; the College of Engineering Department of Computer Science; Virginia Tech Carilion Clinic's Health Analytics Research Team, and other colleges, departments, institutes and centers across the Roanoke-Blacksburg campuses. Appendix A provides a detailed list of individuals who have committed to CBHDS membership. Appendix B provides a table of expertise for faculty in the Department of Statistics, with areas relative to biostatistics highlighted in red.
ii. Internal clients of CBHDS will also be multi- and inter-disciplinary, including (but not limited to) faculty, staff and researchers (including students) from Virginia Tech Carilion School of Medicine; Fralin Biomedical Research Institute; Carilion Clinic; Virginia-Maryland College of Veterinary Medicine; Virginia Tech College of Science, including the School of Neuroscience and Departments of Psychology and Biological Sciences; Virginia Tech College of Liberal Arts and Human Sciences, including the School of Education and the Department of Human Development and Family Science; and the College of Agriculture and Life Sciences, including the Department of Human Nutrition, Foods, and Exercise
iii. External clients of CBHDS may include researchers from other academic institutions (faculty, staff and students), industry, and/or government.
iv. Faculty members of CBHDS and their graduate and undergraduate research teams will have access to center resources to carry out research projects that require support in data management, building REDCap databases, study design, power and sample size estimation, grantsmanship, data analysis, data visualization, manuscript, abstract, and poster support.
v. Student involvement in CBHDS will be strong. Students of Statistics (and potentially other departments and schools) will serve as volunteers and paid interns to gain experience in collaborative biostatistics. There are plans to explore post-doc and

cooperative opportunities for students of biostatistics, data science, health analytics, epidemiology, public health, and/or related fields. CBHDS will bring visibility to our research and academic programs, attracting high quality graduate students and providing VT undergraduates with specialized collaborative research experience.

vi. The Director of CBHDS will lead the development of a self-supporting, professionally-oriented (SSPO) advanced degree program in Biostatistics and Health Data Science at the Roanoke campus. Within five years, students will be able to earn an MS degree through in-depth training in classical biostatistics theory, applied methodology, and contemporary data science techniques. Core coursework will be taught by center members; thesis committees will be interdisciplinary and draw from center membership. Hands-on research projects will be carried out collaboratively among center members and rely on challenging and complex datasets in the health and life sciences, exposing our students to rigorous methodologic training and real-world experience in contemporary computing and collaboration.

Governance

CBHDS is a college-level center, with the following roles and governance:

i. Administrator: Dean, College of Science. The Dean of the College of Science assumes responsibility for fiscal oversight and accountability at the operational level.
ii. Director: Alexandra Hanlon, Professor of Practice in Biostatistics. Dr. Hanlon has day-to-day authority for the fiscal, administrative, fiduciary, and programmatic/scholarly functions of CBHDS. Dr. Hanlon reports to the Dean of the College of Science for all fiscal and administrative matters.
iii. Assistant Director of Research and Training: TBN as the center grows and funding becomes available. This person will have responsibility for coordination of research-related outreach activities, as well as workshop and training initiatives. This person will report to the Director.
iv. Stakeholder Committee:
    a. Dean, College of Science
    b. Head, Department of Statistics, College of Science
    c. Assistant Dean and Director of Finance and Administration, College of Science
    d. Associate Dean for Faculty Affairs and Administration, College of Science, (also liaison with Advisory Committee)
    e. Alexandra Hanlon, Director of CBHDS, Professor of Practice, Department of Statistics, College of Science
v. Advisory Committee:
    a. Dean, College of Science
    b. Executive Director, Fralin Biomedical Research Institute at VTC
    c. Chief Medical Officer and Chief Medical Information Officer, Carilion Clinic
    d. Dean, VA-MD College of Veterinary Medicine
    e. Head, Department of Statistics, College of Science

f. Assistant Dean for Research, Virginia Tech Carilion School of Medicine
g. Senior Director of Research and Development, Carilion Clinic
h. Head, Department of Population Science, VA-MD College of Veterinary Medicine
i. Associate Dean for Faculty Affairs and Administration, College of Science, (also liaison with Stakeholder Committee)
j. Alexandra Hanlon, Director of CBHDS, Professor of Practice, Department of Statistics, College of Science

Resources

The anticipated resource needs for CBHDS follow. Appendix C provides details around resource needs, anticipated costs, and sources of funding or needs.

i. Space: 6 offices (ALH, LH, AT, drop-down space, 2 hires), conference room, large room to house cubes/space for six student interns
ii. Hardware: laptops, monitors, accessories, two servers (non-PHI, PHI)
iii. Software: SAS, R/R Studio, JMP, PASS, SPSS, Stata, Atlas, MS Office, Adobe Professional
iv. Staff: administrative support, IT support
v. Professional allowance: conference travel, textbooks, poster printing, etc…
vi. Events: speaker series, specific aims workshops, brown-bag lunch journal clubs, training (R, JMP, etc)

External Funding Forecast

According to CTSA-based BERD units (Perkins et al, 2016), an effective funding model for a sustainable collaborative biostatistics unit in an academic health center requires a diverse portfolio that includes core grant support (eg, iTHRIV), research grants (eg, NIH R01, etc), collaborating academic units (eg, Orthopedics, Psychiatry, etc), and institutional support (eg, College of Science. Funding diversity results in greater center stability and accommodates various types of projects and funding levels. Under this structure, biostatisticians will engage in a broader range of research and participate in training and mentoring activities, resulting in greater job satisfaction, security, and retention. Perkins et al also emphasize the need for a baseline level of ongoing institutional support to support key functions that add value, yet are not directly funded by grants (eg, grant writing for unfunded faculty, mentorship, training, service, administration, etc). Accordingly, CBHDS proposes a diverse funding model as shown in Appendix C, including core grant support, research grants, academic units (in time), and the College of Science.

Funding Sources

i. Funding to support the Director's AY salary will come from the College of Science, Department of Statistics.
ii. Start-up funds provided by the College of Science will be used to cover the Director's Year 1 and 2 summer salary, a PhD statistician/programmer new hire's salary in Years 1 and 2, hardware, software, professional and faculty development/training.
iii. Beyond start-up, external federal and foundation grants will support Director summer salary, administrative support, and one center hire.
iv. Beyond start-up, finance and administrative (F&A) distributions from external federal grants will cover software, and professional development expenses.
v. Dr. Hanlon has secured the following funding to cover administrative support and one hire through 12/2021. It is expected that successful Virginia Tech grant submissions will cover a similar level of funding as these grants end.
    a. Mary Naylor, UPenn SON New Courtland Center for Transitions grant, 5/1/19 through 8/30/19, Population Health Initiative, $27,723.
    b. Mary Naylor, UPenn SON New Courtland Center for Transitions grant, 7/1/19 through 6/30/20, Population Health Initiative, $56,000.
    c. Mark Fogel (PI, CHOP), R01 (HL090615), 1/1/19 through 6/30/19, Cerebral Anatomy, Hemodynamics, and Metabolism in Single Ventricles: Relationship to Neurodevelopment, $28,759.
    a. Nalaka Gootneratne (PI), NIH R01 (AG054435), 1/1/19 through 5/31/21, Changing the Trajectory of Mild Cognitive Impairment with CPAP Treatment of Obstructive Sleep Apnea, $130,000.
    b. Kathy Richards (PI), NIH R01 (AG051588), 4/1/19 through 3/31/21, Nighttime Agitation and Restless Legs Syndrome in People with Alzheimer's Disease, $147,792.
    c. University of Virginia, Inova Health System, Virginia Tech, and Carilion Clinic (NIH CTSA), 2/28/19 through 2/27/24, The Integrated Translational Health Research Institute of Virginia (iTHRIV), ALH 10% FTE+graduate RA.
vi. In January 2021, a usage evaluation for the center's first 18 months will be performed, along with a needs assessment. This will serve to guide conversations around retainer agreements with internal (VT, Carilion, VTCSOM) colleges and/or departments to support the center over the long-term.

Sources of Resource Needs

i. Four office spaces in Four Riverside Circle will be dedicated to CBHDS, along with a conference room. Current space in the form of four cubicles is located in One Riverside Circle through a rental agreement between the College of Science and the College of Agriculture and Life Sciences via funding from the Provost Office.
ii. The College of Science will provide IT support through the Department of Statistics' dedicated support person.

Anticipated Distribution of Returned Indirect Costs

For indirect costs, F&A will be distributed according to the total costs associated with the specific college/department/center. For proposals where CBHDS plays a major role, the College of Science will return 20% of its share of the F&A to CBHDS. For example, if Dr. Hanlon were awarded funding as a co-investigator at 20% with a principal investigator from the School of Medicine (who is responsible for 80% of the total costs), 80% of the 40% F&A distribution would go to the School of Medicine, while 20% would go to the College of Science. The College of Science will then distribute the 20% portion of the F&A according to a 40-40-20 college-department-center split.

In situations where CBHDS plays a major role on a research proposal, and it is agreed upon by the specific college or school, a non-standard F&A distribution may be arranged using a Form C within the Summit system. This would allow for collaborating schools, such as the School of Medicine, to distribute a portion of its share of the F&A to CBHDS.

Note that indirect costs apply to core CBHDS faculty as defined by those included in the five-year fiscal plan (ALH, LH, AL, KM, and faculty lines proposed in years 2 and 4). We will give CBHDS members the option to submit for external grant funding through the center.

Metrics for Evaluation

Another best practice (Perkins et al, 2016) includes formal tracking and evaluation of consulting and collaboration activity metrics to document productivity for funders and to justify requests for additional resources when needed. Additionally, yearly summary reports of CBHDS activities and fiscal status are required for review by governance committees. In accordance with Rubio et al's report (2011) on evaluation metrics for biostatistics and epidemiology collaborations, as established by members of biostatistics, epidemiology, and research design (BERD) units within the consortium of academic health centers funded by the Clinical and Translational Science Award Program of the National Institutes of Health (CTSA), evaluation metrics will fall into two of the three domains of BERD practices: (1) the development and maintenance of collaborations with clinical and translational science investigators; and (2) the application of BERD-related methods to clinical and translational research. The third domain, the discovery of novel BERD-related methodologies, is not relevant to CBHDS under iTHRIV, as methods development will take place at the University of Virginia under the direction of Dr. Karen Kafadar as Commonwealth Professor and Chair of the Department of Biostatistics.

Regarding collaborations with clinical and translational science investigators, the following will be summarized and reported: time spent on collaborative research activities; number of consultations; number of investigators; number of study teams created; number of times CBHDS members are included as co-investigator on a grant, as coauthor on a manuscript,

abstract, poster, and/or presentation. The Virginia Tech Office of Sponsored Projects' Summit system will be used to capture percent effort on, or time dedicated to, funded activities. The software system TSheets will be used to capture time in terms of hours and number of investigators collaborated with. At the end of each week, CBHDS core members will reflect on their weekly activities, record hours spent on each project and number of consultations. Additionally, the number of individual research investigators that have requested support from the center, along with the type of support requested, will be reported. This information will be captured via a "request for support" system developed in REDCap. Bi-annual Qualtrics surveys sent to CBHDS members will seek input on manuscript submissions and published work in the form of paper, abstracts, or presentations. This information should not be too burdensome, as it will facilitate and complement annual faculty activity reporting requirements.

Educational activities will be summarized according to type (lecture, workshop, online course, etc), affiliation external to CBHDS (institution, college, department, etc), reach (level of learners, number of learners), effort expended (time spent on preparation, delivery, grading, etc), grades, and evaluations (peer and learner). Similar information will be reported for mentorship activities: type, reach, effort, and success stories. Finally, investigator satisfaction will be captured, and summarized in annual reports, by follow-up queries regarding timeliness, professionalism, collegiality, efficiency, and knowledge base.

For the second domain, application of BERD-related methods to clinical and translational research, metrics will relate to more in-depth quantification of grant proposals and contracts, manuscripts, abstracts, and presentations. For proposals and contracts, the following will be summarized: number of total submissions and resubmissions (overall and by type—source, mechanism, etc); number of funded submissions, dollars requested vs awarded, and dollars allocated to CBHDS members; and CBHDS contribution to proposal efforts. For abstracts and presentations, CBHDS activity will be broken down by the inclusion of core members as co-authors and the forum (local, regional, national, international). For manuscripts, details will be summarized in terms of count, impact factor metrics, the inclusion of core members as co-authors and CBHDS contribution. Finally, professional service activities of CBHDS members will be reported in terms of peer-reviewed manuscripts, study sections served on and number of proposals reviewed, number of protocols reviewed for human subjects' protection, participation on journal editorial boards, participation on data safety and monitoring boards or similar panels, participation in planning conferences, and leadership in professional societies.

Qualifications of the Director

Dr. Hanlon earned her BS degree in Mathematics from Rochester Institute of Technology, her MS in Mathematical Statistics from the University of California at Irvine, and her PhD in Biostatistics from Temple University. Dr. Hanlon has over 30 years of experience collaborating with clinical investigators on studies involving population health and electronic health record data, claims and resource use data, cancer, patient reported outcomes, aging and transitions, sleep, stress, obesity, and health disparities. Over the past ten years, she built a productive,

collaborative, interdisciplinary laboratory at the University of Pennsylvania. In this role, she led a group of statisticians, programmers, data managers, and computer scientists in efforts to support faculty and graduate students on projects and proposals requiring a quantitative infrastructure. She is passionate about mentoring students of statistics, as well as statisticians early in their career, and has led several efforts to promote mentorship in the profession. Through her work in the pharmaceutical industry, she has experience designing studies involving primary data collection to support early phase human subject clinical trials through large population-based post surveillance studies. In academia, she has extensive experience analyzing observational data, both prospective and retrospective, including large publically available datasets requiring complex sample survey methodology. Dr. Hanlon has been instrumental in the design and analysis of various studies involving oncology and the microbiome, treatment, symptoms and quality of life, survival, preferences, decision-making, and utilities. Her work focuses on the application of contemporary and sophisticated methods to address research questions within a team science framework, including longitudinal data analysis (eg, hierarchical nonlinear mixed effects modeling), propensity score modeling, and machine learning methods. She has been a member of the PCORI review panel since its inception and a statistical reviewer for many high-impact peer-reviewed journals. As an independent collaborating biostatistician, her partnerships include national cooperative groups, along with clinical investigators from the University of Pennsylvania, Stanford, University of Delaware, University of Maryland, University of Hawaii, Duke, Christiana Health Care System, and Weight Watchers. She has an impressive funding record and over 320 published peer-reviewed journal articles. Dr. Hanlon is an active member of many professional organizations, including Past Chairman for the Counsel of Chapters Governing Board of the American Statistical Association. In 2019, she was honored as a Fellow of the American Statistical Association. In summary, Dr. Hanlon's training, experience, leadership and mentorship skills, service to the profession and community, and collaborative network make her the ideal candidate to successfully direct CBHDS.

Summary

To summarize and further justify the need for CBHDS, we quote the joint work of the Biostatistics, Epidemiology, and Research Design (BERD) Key Function Committee of the Clinical and Translational Science Awards (CTSA) Consortium (Welty et al, 2013) entitled *Perspective: Strategies for Developing Biostatistics Resources in an Academic Health Center:*

*"*Biostatistics—the application of statistics to understanding health and biology—provides powerful tools for developing research questions, designing studies, refining measurements, analyzing data, and interpreting findings. Biostatistics plays an important role in health-related research, yet biostatistics resources are often fragmented, ad hoc, or oversubscribed within academic health centers. Given the increasing complexity and quantity of health-related data, the emphasis on accelerating clinical and translational science, and the importance of conducting reproducible research, the need for the thoughtful development of biostatistics resources within academic health centers is growing."

The committee describes strategies for building strong biostatistics resources, which can be leveraged to support a broad spectrum of research, as we have in our diverse setting of researchers from Carilion Clinic, Fralin Biomedical Research Institute, Virginia Tech Carilion School of Medicine, and Virginia Tech. The ultimate recommendation is that academic health centers create centralized biostatistics units such as the proposed CBHDS, as this approach offers distinct advantages both to investigators who collaborate with biostatisticians as well as to the biostatisticians themselves, and it is better suited to accomplish their research and education missions. CTSA guidance papers pertinent to collaborative biostatistics units in academic health centers, along with personal discussions with their co-authors, will serve as the basis for the CBHDS foundation and business model.

References

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Appendix A: Current CBHDS Members			
NAME	**INSTITUTION**	**COLLEGE**	**DEPARTMENT**
Idris Adjerid, PhD	VT	Pamplin College of Business	Department of Business Information Technology
Charlotte Baker, DrPH, MPH, CPH	VT	VA-MD College of Veterinary Medicine	Department of Population Health Sciences
Doug Bowman, PhD	VT	College of Engineering	Department Computer Science
Anne Brown, PhD	VT	University Libraries	Research and Informatics
Alasdair Cohen, PhD	VT	VA-MD College of Veterinary Medicine	Department of Population Health Sciences
Kevin Davy, PhD	VT	College of Agriculture and Life Sciences	Department of Human Nutrition, Foods, and Exercise
Pang Du, PhD	VT	College of Science	Department of Statistics
Christopher Franck, PhD	VT	College of Science	Department of Statistics
Ron Fricker, PhD	VT	College of Science	Department of Statistics
Maria Stack Hankey, PhD	VTCSOM*		Fralin Bimedical Research Institute
Kimberly Horn, EdD	VT/ VTCSOM*	VA-MD College of Veterinary Medicine	Department of Population Health Sciences
Leanna House, PhD	VT	College of Science	Department of Statistics
Laura Hungerford, DVM, MPH, PhD, CPH	VT	VA-MD College of Veterinary Medicine	Department of Population Health Sciences
Leah Johnson, PhD	VT	College of Science	Department of Statistics
Lara Khansa, PhD	VT	Pamplin College of Business	Department of Business Information Technology
Inyoung Kim, PhD	VT	College of Science	Department of Statistics
Christopher Lawrence, PhD	VT	College of Science	Department of Biological Sciences
Timothy Long, PhD	VT	College of Science	Department of Chemistry
Alicia Lozano, MS	VT	College of Science	Department of Statistics
Frances McCarty, PhD	VT	College of Science	Department of Statistics
Kate Miller, MS	VT	College of Science	Department of Statistics
Sally Morton, PhD	VT	College of Science	Department of Statistics
Rolf Müller, PhD	VT	College of Engineering	Department Mechanical Engineering
Padma Rajagopalan, PhD	VT	College of Engineering	Department of Chemical Engineering
Shyam Ranganathan, PhD	VT	College of Science	Department of Statistics
Srijan Sengupta, PhD	VT	College of Science	Department of Statistics
Allison Tegge, PhD	VT	College of Science	Department of Statistics
Mattie Tenzer, MS	Carilion Clinic		Health Analytics Research Team
Jennifer Van Mullekom, PhD**	VT	College of Science	Department of Statistics
Min Wang, PhD	Carilion Clinic		Health Analytics Research Team
Stephen Werre, BVM, MS, PhD	VT	VA-MD College of Veterinary Medicine	Department of Population Health Sciences
Jay Winkeler Jr., MS	VT	Pamplin College of Business	Center for Business Intelligence and Analytics
Xiaowei Wu, PhD	VT	College of Science	Department of Statistics
Hongxiao Zhu, PhD	VT	College of Science	Department of Statistics
Christopher Zobel, PhD	VT	Pamplin College of Business	Department of Business Information Technology
* VTCSOM = Virginia Tech Carilion School of Medicine; **Director of Statistical Applications and Innovations Group (SAIG)			

Appendix B

Faculty Research Fields in the Department of Statistics, Virginia Tech (prepared by Hongxiao Zhu; Aug. 10, 2018)

The following list is based on information from the website of department of statistics and/or faculty members' professional websites. Areas that are related to biostatistics are highlighted in red.

NAME	RESEARCH AREAS	WEB LINK
Xinwei Deng	Design of experiments, machine learning, nanotechnology, computer experiments, financial services.	https://www.apps.stat.vt.edu/deng/
Anne Driscoll	Statistical process control, healthcare surveillance, industrial statistics.	https://www.stat.vt.edu/people/stat-faculty/Driscoll-Anne.html
Pang Du	Functional data, statistical learning, survival data, diagnostic test and ROC.	https://www.apps.stat.vt.edu/du/
Jane Robertson	Statistics education, collaborative learning, student self-efficacy, program evaluation.	https://www.stat.vt.edu/people/stat-faculty/Evia-Jane.html
Marco Ferreira	Spatial-temporal analysis, Bayesian, inverse problems, environment, medicine, epidemiology.	https://www.apps.stat.vt.edu/ferreira/
Chris Franck	Bayesian, spatial statistics, design of experiments, health applications, bioinformatics, medicine.	https://www.stat.vt.edu/people/stat-faculty/Franck-Christopher.html
Ron Fricker	Quality control and statistical process control, biosurveillance, survey design and analysis, data analytics and data science	https://www.stat.vt.edu/people/stat-faculty/Ronald-Fricker.html
Bobby Gramacy	Computing, computer experiment, stochastic control, response surface modeling.	http://bobby.gramacy.com/research/
Feng Guo	Bayesian models, transportation safety modeling, spatial statistics, generalized linear models.	https://www.stat.vt.edu/people/stat-faculty/Guo-Feng.html
David Higdon	Space-time modeling, inverse problems in hydrology/imaging, ecology, environmental science, biology, computing and simulation.	https://www.bi.vt.edu/faculty/Dave-Higdon
Ina Hoeschele	Statistical genetics and genomics, human genetics and genomics, Bayesian, variable selection.	https://www.stat.vt.edu/people/stat-faculty/Ina-Hoeschele.html
Yili Hong	Reliability data analysis; engineering statistics, survival analysis; biomedical statistics, spatial analysis; epidemiology.	https://www.apps.stat.vt.edu/hong/
Leanna House	Bayesian, data mining and data visualization, applications in proteomics, bioinformatics, cosmology, climatology, and hydrology.	https://www.stat.vt.edu/people/stat-faculty/House-Leanna.html
Leah Johnson	Bayesian, biological systems, mathematical models, infectious diseases epidemiology, behavioral and population ecology.	http://leah.johnson-gramacy.com/QED/
Sallie Keller	Social/decisions analytics, big data, uncertainty quantification, computational/graphical statistics, data access/ confidentiality.	https://www.bi.vt.edu/sdal
Inyoung Kim	Semi/Nonparametric Models, Mixed Model, Machine Learning, Functional Analysis, Measurement Error, Bayesian, Biostatistics, Bioinformatics.	https://www.apps.stat.vt.edu/kim/
Scotland Leman	Bayesian, visual analytics, statistical genetics, molecular evolution, epidemiology, coalescence theory, Branching processes, time series.	https://www.apps.stat.vt.edu/leman/
Chris Lucero	Inverse Problems, uncertainty quantification machine learning, computational and statistical methodology, statistical applications.	https://www.stat.vt.edu/people/stat-faculty/Christian-Lucero.html

Appendix B

Hamdy Mahmoud	Semi/nonparametric regression, change point(s) detection, environmental statistics, spatial/spatio-temporal analysis.	https://www.stat.vt.edu/people/stat-faculty/hamdy-mahmoud.html
JP Morgan	Experimental design, combinatorics, discrete optimization	https://www.stat.vt.edu/people/stat-faculty/Morgan-JP.html
Sally Morton	Dean of College of Science	https://www.stat.vt.edu/people/stat-faculty/Sally-Morton.html
Jen Van Mullekom	SAIG director	https://www.stat.vt.edu/people/stat-faculty/Jennifer-Van-Mullekom.html
Shyam Ranganahan	Dynamic models, model selection, econometrics, applications to social sciences, Bayesian, agent-based models, population health analytics, sustainable development, hierarchical modeling, and network.	https://www.stat.vt.edu/people/stat-faculty/Ranganathan-Shyam.html
Srijan Sengupta	Network data, bootstrap, resampling, Big data, and computational statistics.	https://sites.google.com/vt.edu/sengupta
Eric Smith	Multivariate analysis, multivariate graphics, biological sampling and modeling, Ecotoxicology, data analytics, Visualization	https://www.stat.vt.edu/people/stat-faculty/Eric-Smith.html
Allison Tegge	Graphical Models, data mining, statistical computation, protein-protein Interaction Networks, computational systems biology, gene expression analysis, cellular signaling and regulation.	https://www.stat.vt.edu/people/stat-faculty/Tegge-Allison.html
George Terrell	Nonparametric density estimation, Multivariate nonparametric methods, Projection pursuit methods.	https://www.stat.vt.edu/people/stat-faculty/George-Terrell.html
Geoff Vining	Experimental design and analysis for quality improvement, response surface, statistical process control.	https://www.stat.vt.edu/people/stat-faculty/Vining-Geoff.html
Bill Woodall	Statistical quality control, control charting, health-related monitoring and prospective public health surveillance, social network monitoring.	https://www.stat.vt.edu/people/stat-faculty/Woodall-Bill.html
Xiaowei Wu	Statistical genetics, bioinformatics, Bayesian and computational Statistics, Branching Processes.	https://www.apps.stat.vt.edu/wu/
Hongxiao Zhu	Bayesian, Functional Data Analysis, Machine Learning, Applications in biomedical imaging, neuroimaging, medical signals and spectrum data.	https://www.apps.stat.vt.edu/zhu/

Appendix C: Resource Needs and Sources

Resource Needs:

Salary and fringe Director (ALH)	300K (12 months) (x1.37)*
Salary and fringe Project Associate/Business Administrator (KM)	35K**
Salary and fringe PhD Statistician/Programmer (LH)	110K
Salary and fringe MS Statistician (AL)	105K
Student Support	30K
Hardware (Years 1 and 5)	15K
Software	5K
Seminar speakers, workshops, faculty education	10K
Professional Development	10K
Faculty lines in Years 2/4***	120K x 2
Office space, conference room	
Office space—student cubes	

Note: Core CBHDS faculty/staff include the Director, Project Associate, PhD Statistician/Programmer, MS Statistician, faculty hires in Years 2 and 4, as well as Allison Tegge and Jennifer Van Mullekom. CBHDS assumes responsibility for fiscal planning (and indirect costs) for all core members except AT and JVM.

Proposed Sources of Funds:

Year 1 (7/1/19-6/30/20)

Salary and fringe Director AY (ALH)	240K	COS (E&G)
Salary and fringe Director Summer (ALH)	60K	Grants
Salary and fringe Project Associate/Business Administrator (KM)	35K**	Grants
Salary and fringe PhD Statistician/Programmer (LH)	110K	COS Start-up
Salary and fringe MS Statistician (AL)	105K	Grants
Student Support	30K	Investments TBD
Hardware (Years 1 and 5)	15K	COS Start-up
Software	5K	COS Start-up
Seminar Speakers, workshops, faculty education	10K	COS Start-up
Professional Development	7.5K	COS Start-up
Office space, conference room	15K lease at 1 Riverside Circle TBD	
TOTAL:	**635K**	

Year 2 (7/1/20-6/30/21)

Salary and fringe Director AY (ALH)	240K	COS (E&G)
Salary and fringe Director Summer (ALH)	60K	COS Start-up
Salary and fringe Project Associate/Business Administrator (KM)	35K**	Grants
Salary and fringe PhD Statistician/Programmer (LH)	110K	Grants
Salary and fringe MS Statistician (AL)	105K	Grants
Student Support	30K	Investments TBD
Software	5K	Indirect costs
Seminar Speakers, workshops, faculty education	10K	COS Start-up
Professional Development	7.5K	COS Start-up
Faculty line Year 2***	120K	COS (E&G)
Office space, conference room	SOM	
Office space—student cubes	TBD	
TOTAL:	**725K**	

JANUARY 2021: NEEDS ASSESSMENT AND SEEK RETAINER AGREEMENTS

Year3 (7/1/21-6/30/22)

Salary and fringe Director AY (ALH)	240K	COS (E&G)
Salary and fringe Director Summer (ALH)	60K	Grants and COS Start-up
Salary and fringe Project Associate/Business Administrator (KM)	35K**	Grants
Salary and fringe PhD Statistician/Programmer (LH)	110K	Grants and Retainers
Salary and fringe MS Statistician (AL)	105K	Grants and Retainers
Student Support	30K	Investments TBD
Software	5K	Indirect costs
Seminar Speakers, workshops, faculty education	10K	COS Start-up
Professional Development	10K	Indirect costs
Faculty line Year 2***	120K	COS (E&G)
Office space, conference room	SOM	
Office space—student cubes	TBD	
TOTAL:	**725K**	

Year 4 (7/1/22-6/30/23)

Salary and fringe Director AY (ALH)	240K	COS (E&G)
Salary and fringe Director Summer (ALH)	60K	Grants
Salary and fringe Project Associate/Business Administrator (KM)	35K**	Grants
Salary and fringe PhD Statistician/Programmer (LH)	110K	Grants and Retainers
Salary and fringe MS Statistician (AL)	105K	Grants and Retainers
Student Support	30K	Investments TBD
Software	5K	Indirect costs
Seminar Speakers, workshops, faculty education	10K	Indirect costs
Professional Development	10K	Indirect costs
Faculty line Year 2***	120K	COS (E&G)
Faculty line Year 4***	120K	COS (E&G)
Office space, conference room	SOM (need additional space)	
Office space—student cubes	TBD	
TOTAL:	**845K**	

Year 5 (7/1/23-6/30/24)

Salary and fringe Director AY (ALH)	240K	COS (E&G)
Salary and fringe Director Summer (ALH)	60K	Grants
Salary and fringe Project Associate/Business Administrator (KM)	35K**	Grants
Salary and fringe PhD Statistician/Programmer (LH)	110K	Grants and Retainers
Salary and fringe MS Statistician (AL)	105K	Grants and Retainers
Student Support	30K	Investments TBD
Software	5K	Indirect costs
Hardware (Years 1 and 5)	15K	TBD
Seminar Speakers, workshops, faculty education	10K	Indirect costs
Professional Development	10K	Indirect costs
Faculty line Year 2***	120K	COS (E&G)
Faculty line Year 4***	120K	COS (E&G)
Office space, conference room	SOM (need additional space)	
Office space—student cubes	TBD	
TOTAL:	**860K**	

**Rough estimates, based on estimated fringe rate of 37%*

***half time, annual base salary of $45K*

****proposed two faculty lines in years 2 and 4 to support center growth and new MS Biostatistics degree program*

COS=College of Science; E&G=VA Education and General funds; TBD=to be determined; SOM=School of Medicine

Commission on Research
Committee on Research Competitiveness
Benjamin Corl, Stefan Duma (Chair), Barry Miller, Kurt Zimmerman

Enterprise Models, Structures, and Strategies for Federal and Alternative Funding

Overview

Institutions have a wide variety of organizational structures, strategies, and processes related to research and educational initiatives all primarily oriented towards the quest for securing external funding. The goals of this research group were to address two major questions: 1) How are institutions improving their competiveness (structures, strategies, processes) for government grants and 2) increasing support for alternative sources of funding (foundations, corporate relations, partnerships, etc.).

Methods

To address the above questions the team utilized the following four strategies:

1) Benchmark list: The 2016 NSF Higher Education Research & Development (HERD) report was used to choose schools ranked in the top 25 (Appendix A).
    a) document listed funding amounts
    b) record research web page location and information

2) Benchmark via web pages: A review of institutional web pages was used to:
    a) collect the types of structures and models used (Centers, Institutes, etc.)
    b) define or classify Centers and Institutes
    c) document the volume/number of Centers and Institutes (Appendix B)
    d) review major research initiatives, themes, programs
    e) outline research offices/services provided by OVPR

3) Benchmark via interviews: Phone interviews were conducted of selected schools (see Table 1, interview questions in Appendix C)
    a) effectiveness of structures – current status
    b) gather insight to challenges, operational processes, strategies,
    c) centralized versus de-centralized approaches
    d) major funding strategies, success, support
    e) proposal development
    f) strategic directions of the office/unit

4) Utilize Georgia Tech report on Interdisciplinary Research Institutes (IRIs):
    a) types of organizational structures
    b) levels and types of financial support
    c) operational processes and comparisons
    d) overall assessment of these IRIs

1) Benchmark list

The NSF's Higher Education Research and Development (HERD) Report lists the total research expenditures for a given institution. This list can then be rank ordered according to these total expenditures (Figure 1). John's Hopkins University ranked 1st with $2.43 billion with the University of Michigan following with $1.44 billion. The average expenditure for the top 25 institutions was $685 million. Virginia Tech was listed as #43 with $522 million in research expenditures. The top 25 schools reviewed can be found in Appendix A.

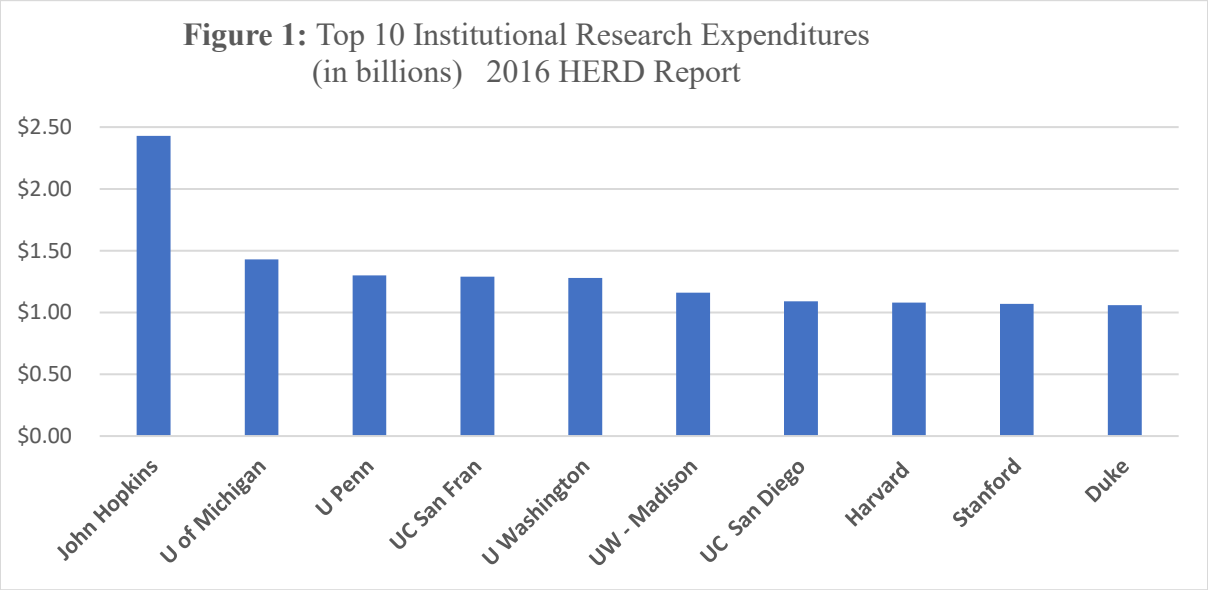


Figure 1: Top 10 Institutional Research Expenditures (in billions) 2016 HERD Report

2) Benchmark via web pages

Types: Many institutions have adopted and/or created models that include research groups or themes and used a variety of terms to name them. These terms include: Centers, Institutes, Initiatives, Bureaus, Clinics, Consortiums, Divisions, Alliances, Labs, Forums, and possibly others. Each institution may define their entities differently.

Definitions/Classifications: Additionally, these definitions may differ between institutions but also these may differ among the separate colleges at a given same institution. The use of the terms "Centers" and "Institutes" are widely adopted and thus used for general analysis to determine the scope of these structures.

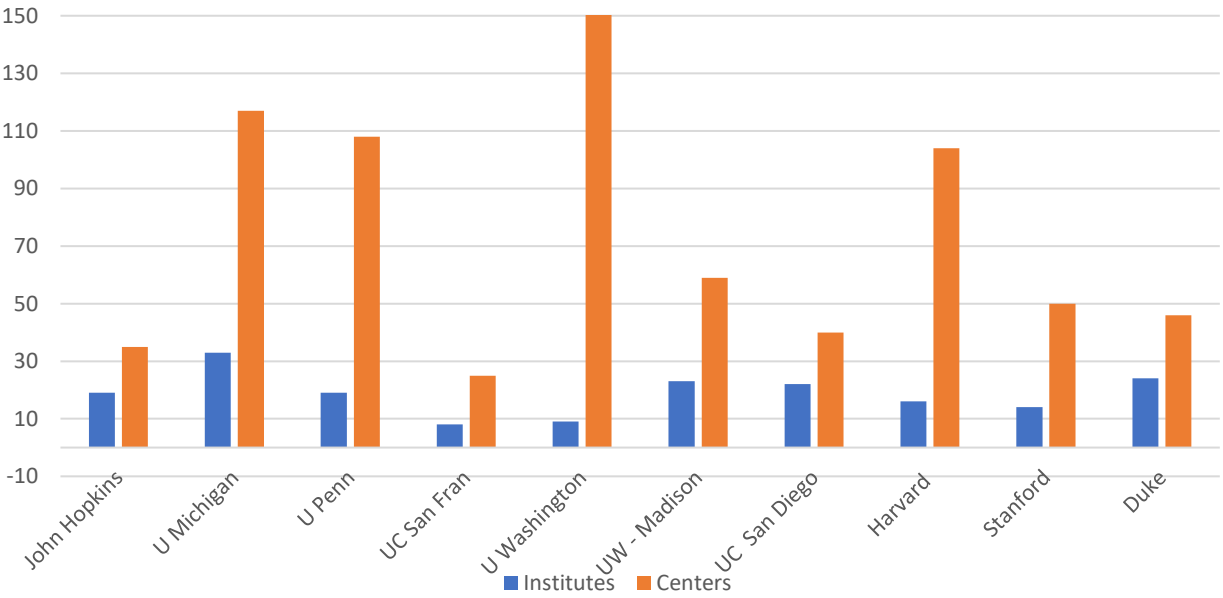
In general, Centers are entities that primarily function within a specific college and across several departments. Institutes typically have a broader scope and operate between and among several colleges; but again some centers were considered "university" or transdisciplinary centers and thus cut across several colleges. The underlying premise for all of these entities collectively seems to be the creation of a multidisciplinary or transdisciplinary structure that is flexible, provides opportunity and collaboration among researchers from various fields, industries, and government agencies.

One Example from the University of Arizona outlines the following:
University Research Institutes and Centers (URICs) are expected to:

1. *Lead efforts and design activities that bring together researchers from across campus in large scale, interdisciplinary collaborations that result in new forms of research and shared scholarship.*
2. *Enhance competiveness for new forms of extramural support (sponsored and philanthropic) to grow research and engagement to provide substantive public benefit.*
3. *Enhance competitiveness for the hiring of new faculty that leverages existing strengths in new areas of research and stakeholder engagement, and mentor young faculty by expanding their access to new research areas and faculty colleagues.*
4. *Enhance the public impact and visibility of UA research by connecting interdisciplinary scholarship to local, regional, national and international communities.*

Volume: The total number of Centers and Institutes for each institution varied (Figure 2) but overall these top 25 institutions had an average of 26 Institutes and 81 Centers, thus over 100 research entities. These figures were counted as listed on the various webpages for each institution. It should be noted that most institutions had a primary webpage associated with the Office of Vice President for Research (OVPR or similar) dedicated to listing all the various Centers and Institutes. Others opted to have them listed under each associated college or school which was challenging as some Centers or Institutes did not fall under either, and were truly a transdisciplinary entity generally reporting to the OVPR. Additionally, on many webpages for a given Center or Institute the director or primary contact was often not listed making it difficult to determine the viability of the entity. See additional comments under the "interview" section.

Figure 2: Number of "Institutes" and "Centers" of Top 10 Resarch Schools (HERD Report 2016)



Research Initiatives: Most of the institutions reviewed did not have major or university-wide research initiatives listed. However there were a few institutions that did centrally control (OVPR or President's Office) and solicit proposals for seed funding and prominently marketed. A couple examples that are performing well (per phone interviews) and garnering the desired interest and return on investment (ROI) are Texas A&M, Michigan, Johns Hopkins, and UPenn.

Johns Hopkins recently concluded a "Rising to the Challenge Capital Campaign". It was a multi-pronged campaign but one crucial component was Interdisciplinary Research. JHU also uses 6 "Signature Initiatives" similar to the Destination Areas found here at Virginia Tech to drive research and funding. The 6 Signature Initiatives include 1) 21st Century Cities, 2) Alliance for Healthier World, 3) Individualized Health Initiatives, 4) Institute for Data Intensive Engineering & Science, 5) Science and Learning Institute, and 5) Space at Hopkins.

Texas A&M uses the President's Excellence Fund Initiative. This is a 10 year $100 million ($10M/year) initiative. It is broken into 2 parts: "T3" and "X" grants. The T3 are transformative research triads (3 different faculty) of 100 teams receiving $30,000 each. The X grants are cross disciplinary proposals and account for the remaining $7 million annually.

UPenn has a Research Grant Support Program that funds up to $50,000 to help faculty secure external funding. They also use a Research Opportunity Development Grant (RODG) that has and initial Phase I providing up to $10,000 and then a Phase II that continues support of $50,000-$200,000. Additionally, the University Research Foundation (URF) has an endowment to assist with operational costs (no overhead for grants) and funding opportunities of $1.5 million annually.

Georgia Tech does not have any formal centralized programs but instead oversee 11 Interdisciplinary Research Institutes (IRIs) that utilize their own funds. The IRIs are 7 years old and were developed to elevate GT's research profile and have single point of contact/access.

The University of Michigan incorporates a program called MCubed. It requires a team of 3 researchers and must be transdisciplinary with up to $60,000 of seed funding. It is a 3 year $15 million ($5M/year) program to jump start transdisciplinary research efforts. They also have 8 Interdisciplinary Research Initiatives: 1) Data Science, 2) Precision Health, 3) Biosciences, 4) Poverty Solutions, 5) Sport Science, 6) Urban Collaboratory, 7) Humanities Collaboratory, 8) Global CO_2.

Arizona State, while not in the HERD top 25, was included due to their unique nature and quick ascent in rankings. They use "Research Growth Areas" which are similar to VT's Destination Areas. They include: 1) Climate Adaptation, 2) Energy, 3) Food, 5) Health and Wellbeing, 6) Materials and Manufacturing, 7) Space, 8) Transportation, and 9) Water. One unique aspect of the available seed funding comes from a state sales tax ($3 million annually). The president also has a $12 million budget to assist "strategic" initiatives.

OVPR Services: The level of centralized support and coordination was also collected. While there was a wide variety of office names and specific types of services provided, there were

some common items. The centralized services provided by the OVPR most commonly found were related to: 1) Limited Submission Coordination, 2) Human Subjects/Institutional Review Board, 3) Government Relations, 4) Economic Development/Industry Collaboration/Entrepreneurship, 5) Sponsored Programs, 6) Intellectual Property/Technology Transfer, and 7) Compliance/Ethics. Training efforts were not commonly found but did exist with some schools. Our interview data indicated that most of the individual colleges and schools conducted their own training for junior faculty and associated administrators. Arizona State was one institution working hard to "centralize" many research associated efforts.

3) Benchmark via phone interviews

Seventeen institutions were included for phone interviews (Table 1). These were selected based on ranking in top 5 of HERD report as well as personal contacts and affiliations with other institutions. Interviews included contacts from the Offices of Vice President for Research (VP, Associate VPs, Department Chairs, and faculty members). The phone interviews gathered information on several general areas that included (Appendix C): Structure Effectiveness, Challenges, Centralization, Funding, Proposal Development, Faculty Development, and Strategic Initiatives.

Table 1: Phone Interview Institutions

School Name	Type of Contact
Johns Hopkins	OVPR
University of Michigan	OVPR
University of Pennsylvania	OVPR
University of Washington	OVPR
Arizona State University	OVPR
University of Minnesota	Faculty
Georgia Tech University	OVPR
Texas A&M University	OVPR
Cornell University	Faculty
Iowa State University	Faculty
North Carolina State University	Faculty
Penn State University	Faculty
University of Florida	Department Chair
University of Maryland	Department Chair
Univ. of California, Davis	Faculty
Michigan State University	Faculty
University of Idaho	OVPR

Structure Effectiveness: Current Status: Overall, most schools felt the structures in place at their respective institutions were effective. However, nearly all the contacts stated that the review and management of Centers and Institutes has become difficult. Many were trying to "sun-set" poorly functioning entities. The challenges were due to many "named" centers and related politics associated with them. Most contacts did state that the "marketing" value of all the centers did seem helpful in attracting funding.

Challenges: From the contacts in OVPR offices, the major challenges stated were related to the overall volume, control, communication, access, and accountability of the vast number of centers and processes. While a decentralized approach from most contacts seemed preferred, the level of strategic thinking and efficient use of all the entities combined was problematic. Many of the entities' useful lives had come to an end and streamlining initiatives and strategies for more collective efficiency were desired but complicated.

Centralization: Nearly all the schools contacted used a "decentralized" approach. Out of the contacts listed there was only one institution making a concerted effort to "centralize" many of the services and processes associated with the research enterprise. The goal was a more efficient and streamlined approach as a collective organization. Most of the contacts supported the decentralized position due to the specific needs of the various Colleges, Centers, and Institutes. Additionally, most OVPR offices do not have adequate resources or topic expertise to manage all of them in great detail.

Seed Funding: There was a diverse range of seed funding opportunities among interviewed faculty. Some had access to funding from several different levels – College, University, Department – while others felt opportunities were very limited. A common theme among those interviewed was a tiered funding approach. Often, three tiers of funding were available and generally targeted toward bringing multi-disciplinary teams together. At the lowest level, many proposals were funded for small amounts (~$500). This low level was meant to fuel the generation of many collaborations and ideas. The subsequent tiers were much more competitive for larger amounts of funding. At one institution, a college program supported $5,000 at the second tier and $50,000 for the third tier. Funding at the final tier was very competitive and supported research teams perceived to have a solid opportunity in securing large awards. There was also a perception that these tiered award strategies promoted the development of research teams that would remain productive and competitive for subsequent proposals and funding.

Proposal Development: Larger proposals tend to be interdisciplinary in nature, requiring the development of research teams. Generally, most faculty interviewed indicated that efforts to develop larger proposals started with faculty. Only two respondents indicated that more centralized efforts promoted the pursuit of larger, multi-investigator proposals. In one case, the effort was based at the college-level. The Associate Dean for Research of the college was known to track proposal opportunities and pull potential faculty participants to pursue grants while assuming the initial organizational efforts to drive a proposal forward. In another case, the VPR was known to pull researchers together to promote development of multi-investigator proposals. These two cases were the exception. One respondent stated that centralized efforts to bring people together were less effective. Another said that faculty needed to come together "organically," and that "forced" teams were rarely effective in executing proposal submission. Teams derived from faculty interest seemed to be the most common, but facilitating them required higher-level support.

Creating a culture of proposal submission and pursuit of funding was considered a key ingredient for promoting success. One faculty respondent indicated that they specifically hired "hungry" new faculty with a desire to pursue funding. Another faculty respondent had experience as an investigator at two institutions and found that the first had much more directed focus on research

productivity and pursuit of proposals. This was cultural as faculty training and development was directed at proposals. Rewards for productivity were targeted toward research activity. One faculty respondent indicated that a strict adherence to a transparent post-tenure review process occurring on a rotating basis every three years among the department's faculty promoted the maintenance of a competitive metabolism among faculty, and that having the whole department review your activity every three years promoted healthy competition within the department.

One senior respondent commented that an important cultural aspect encouraging pursuit of larger, multi-disciplinary proposals was a recent change in attitude for junior faculty seeking promotion. Previously, there was greater emphasis on independence, and this was perceived to force newer, untenured faculty to choose their own proposals over participating in larger teams where credit was spread more diffusely. More recently, administrators are promoting the importance of the development of larger, team-based proposals down to the department level allowing greater participation among more recently hired faculty allowing them to be involved without concerns related to promotion. This leads to their participation but also their development as leaders of these future efforts.

A strategy for organizing research teams used by several institutions was to host small conferences to bring faculty together. In one case, geography separated campuses (several hours drive). The university provided funds for travel, the conference, and refreshments to have an all-day symposium with faculty from the two campuses presenting to each other. The participants came together to share ideas and promote the development of a large proposal (NIH grant). This conference support approach was perceived as very positive and necessary to bring investigators together, especially those who would not normally meet, under a common theme and effort. Two other universities had similar programs that faculty felt were beneficial with direct proposal products sprouting from them.

Faculty Development: Most universities offered some training on proposal writing and development to new faculty. Many utilized an external training program. In most cases, this was administered at the college level. Some universities had general faculty development, but again, this was mostly directed toward new, pre-tenure faculty. In one case, a faculty member had spent his earlier career at one institution and moved mid-career to another. He was able to compare and contrast faculty development between the two institutions. His former institution had robust faculty development and training program directed at helping newly hired faculty get their first award. He felt it was a significant contributor to their success in winning grants. His current institution relied more on word of mouth training and ad hoc mentoring, rather than a centralized, well-developed pipeline, and he felt it was less efficient and largely ineffective. Generally, most faculty interviewed indicated very limited or non-existent training directed toward mid-career or later faculty.

Strategic Initiatives: The use of themes, strategic initiatives, and area of focus were commonly found. These were often developed by the OVPR or major investment/research institutes to stimulate transdisciplinary teams and approaches to address complex problems. These were fairly similar among most institutions and included general themes related to: energy, sustainability, health, materials, big data and similar to Virginia Tech's destination areas.

4) Georgia Tech report on Interdisciplinary Research Institutes (IRIs)

A report generated at Georgia Tech assessing IRIs was attained and reviewed. This report benchmarked 11 schools (Table 2) and various aspects of their major research institutes. In particular the study looked at how various IRIs are structured, supported, operated, and assessed. Here are some key findings:

Table 2: Benchmarking Institutions – Georgia Tech IRI report

Institution Name
Penn State University
Carnegie Mellon University
Purdue University
University of Texas – Austin
University of Illinois
Duke University (Institute of Brain Science)
Ohio State University
FPInnovations (Canadian non-profit)
University of Michigan
California Institute of Technology
Stanford University

Organizational Structure & Funding Model: Many of the Centers or Institutes were born from donor gifts, or an area of interest to multiple faculty. Most of them have a very decentralized structure and funding comes from donors or sponsors. The administrative staff generally have other duties and the associated faculty belong to academic units versus being hired directly into centers or institutes.

Common Resource Utilization: Resources are often shared between the center and a college but not between distinct centers. Their tended to be negative feelings towards centralized resources as respondents felt centralized organizations were slower and less responsive. Depending on size, need, and lifespan of the IRI (new, growing or winding down) the resources needed differed. Newer IRIs need a unique "lift" to get off the ground and on a path to sustainability.

Review process, performance measurement, frequency, effectiveness & "sun-setting": Most of the IRIs utilized college/school deans and external advisory boards to monitor and evaluate the organization. A 5-7 year review cycle was typical. The performance metrics were often not clear and overall impact of the IRI was difficult to measure. Most of the IRIs do have a "sun-setting" policy but very few have been executed due to public relations, political, and related reasons.

Lessons Learned: Institutes should have additional structures versus a Center. IRIs have generally provided better early training and mentoring for their respective leaders. Industry connections were generally considered stronger and funding was enhanced due to less restrictions greater flexibility that IRIs have over centralized models.

Overall Report Summary:

1. Universities utilize a wide variety of structures and models that stem from the need for flexibility related to funding opportunities.
2. All Universities utilize Institute and Center structures to increase faculty visibility and attract funding.
3. Most institutions use "decentralized" research enterprise structures to remain nimble and responsive to opportunities.
4. The use of research themes and initiatives (similar to Virginia Tech's Destination Areas) are common and reflect major research areas (water, energy, sustainability, health, etc.).
5. Universities all utilize complex and variable funding structures (seed grants, overhead sharing, space allocation) to empower faculty teams to form around funding opportunities.
6. Most institutions find it challenging to manage and provide oversight to all of the various Centers and Institute models, especially without developing overly burdensome reporting work for the faculty and administration.
7. It is common for administrative support to be provided for large research proposals, for example, by funding and supporting events for faculty to meet, brainstorm, and organize
8. Faculty training for grant writing is generally limited to new faculty hires at the Assistant Professor level, and little to no training is provided to faculty for large center-level grant funding opportunities.
9. External consultants often facilitate large grant writing and proposal development.
10. Creating a rewarding culture around research is critical and inclusion of research as a vital priority of university activities is paramount.
11. Overall, Virginia Tech is similarly positioned to the top institutions relative to current mechanisms to increase external research.

Recommended Action Items:

1. Continue offering faculty opportunities to assemble and develop research teams using seed-funding programs through the current distributed model.
2. Expand training options for mid-career and more senior faculty aimed at gaining skills for large and complex research programs.
3. Develop a best practice model for evaluating Institutes and Centers with care not to create an overly burdensome system on the faculty as well as the administration.
4. Future Report 1: benchmark and analyze the role of start-up costs in developing research programs and how these costs are covered.
5. Future Report 2: benchmark and analyze the relationship between teaching loads and research productivity, and implications of changing distributions of faculty types.

Appendix A: NSF HERD Report 2016 – top 25

Higher education R&D expenditures, ranked by FY 2016 R&D expenditures
(Dollars in thousands)

Rank	Institution	Expenditures
1	Johns Hopkins University	$2,431,180
2	U. Michigan, Ann Arbor	$1,436,448
3	U. Pennsylvania	$1,296,429
4	U. California, San Francisco	$1,294,261
5	U. Washington, Seattle	$1,277,679
6	U. Wisconsin-Madison	$1,157,680
7	U. California, San Diego	$1,087,117
8	Harvard U.	$1,077,253
9	Stanford U.	$1,066,269
10	Duke U.	$1,055,778
11	U. North Carolina, Chapel Hill	$1,045,338
12	U. California, Los Angeles	$1,037,528
13	Cornell U.	$974,199
14	Massachusetts Inst. of Tech.	$946,159
15	U. Minnesota, Twin Cities	$910,181
16	Texas A&M Health Sci. Center	$892,718
17	U. Pittsburgh, Pittsburgh	$889,793
18	Yale U.	$881,765
19	U. Texas Anderson Cancer Center	$852,095
20	Columbia U. New York	$837,312
21	Penn State Hershey Med. Center	$825,561
22	Ohio State U.	$818,464
23	New York U.	$809,739
24	U. Florida	$791,294
25	Georgia Institute of Technology	$790,706
43	**Virginia Tech**	**$521,773**

Appendix B: Centers and Institutes Data

NSF Grant Funding 2016 Data from HERD Report	Expenditures	# of Institutes	# of Centers
Johns Hopkins	$2.43B	19	35
University of Michigan	$1.43 B	33	117
University of Pennsylvania	$1.3 B	19	108
University of California - San Francisco	$1.29 B	8	25
University of Washington	$1.28 B	9	197
University of Wisconsin - Madison	$1.16 B	23	59
University of California San Diego	$1.09 B	22	40
Harvard University	$1.08 B	16	104
Stanford University	$1.07 B	14	50
Duke University	$1.06 B	24	46
Univ. North Carolina - Chapel Hill	$1.05 B	15	31
Univ. California Los Angeles	$1.04 B	38	92
Cornell University	$974 M	62	63
Mass. Inst. of Technology	$946 M	7	24
Univ. of Minnesota - Twin Cities	$911 M	54	201
Texas A&M - CS Health Science Center	$892 M	45	84
University of Pittsburgh	$890 M	26	124
Yale University	$882 M	24	57
Univ. Texas - Anderson Medical Center	$852 M	6	23
Colombia University	$837 M	36	134
Penn State - Hershey Medical Center	$825 M	22	45
Ohio State University	$818 M	20	91
New York University	$810 M	45	110
University of Florida	$791 M	39	141
Georgia Tech	$791 M	38	94
Virginia Tech*	**$521 M**	**8**	**31**

***as listed per website review**

Appendix C: Phone Interview Questions

1. What administrative models (Centers/Institutes…/methods/initiatives are working well at your university in regards to promoting research funding success? (Centralized vs decentralized). How are the Centers and Institutes funded?

2. Is the preparation of larger proposals directed from the university or is it driven at the Institute, Center, college/department level (central vs distributed)?
    a. Who brings people together or puts teams together to promote these efforts?

3. What is being done at your University/College/Department level to promote research productivity and external funding success in relationship to larger (>$10M) and small proposals? What is working well for driving and promoting research?

4. What is your impression of external funding success for both large and small proposals?

5. What support ($ and administrative) does your University/College/Department provide for the creation of larger multicenter and interdisciplinary proposals?

6. What types and $ amounts of seed funding are made available from your University/College/Department to individuals and larger research groups at your university?

7. What programs does the University/College/Department offer for faculty development? At the junior and senior faculty levels?

VIRGINIA TECH

Commission on Research

TRUDY M RILEY
ASSOCIATE VICE PRESIDENT RESEARCH AND INNOVATION,
SPONSORED PROGRAMS

MAY 8, 2019

Previous Experience

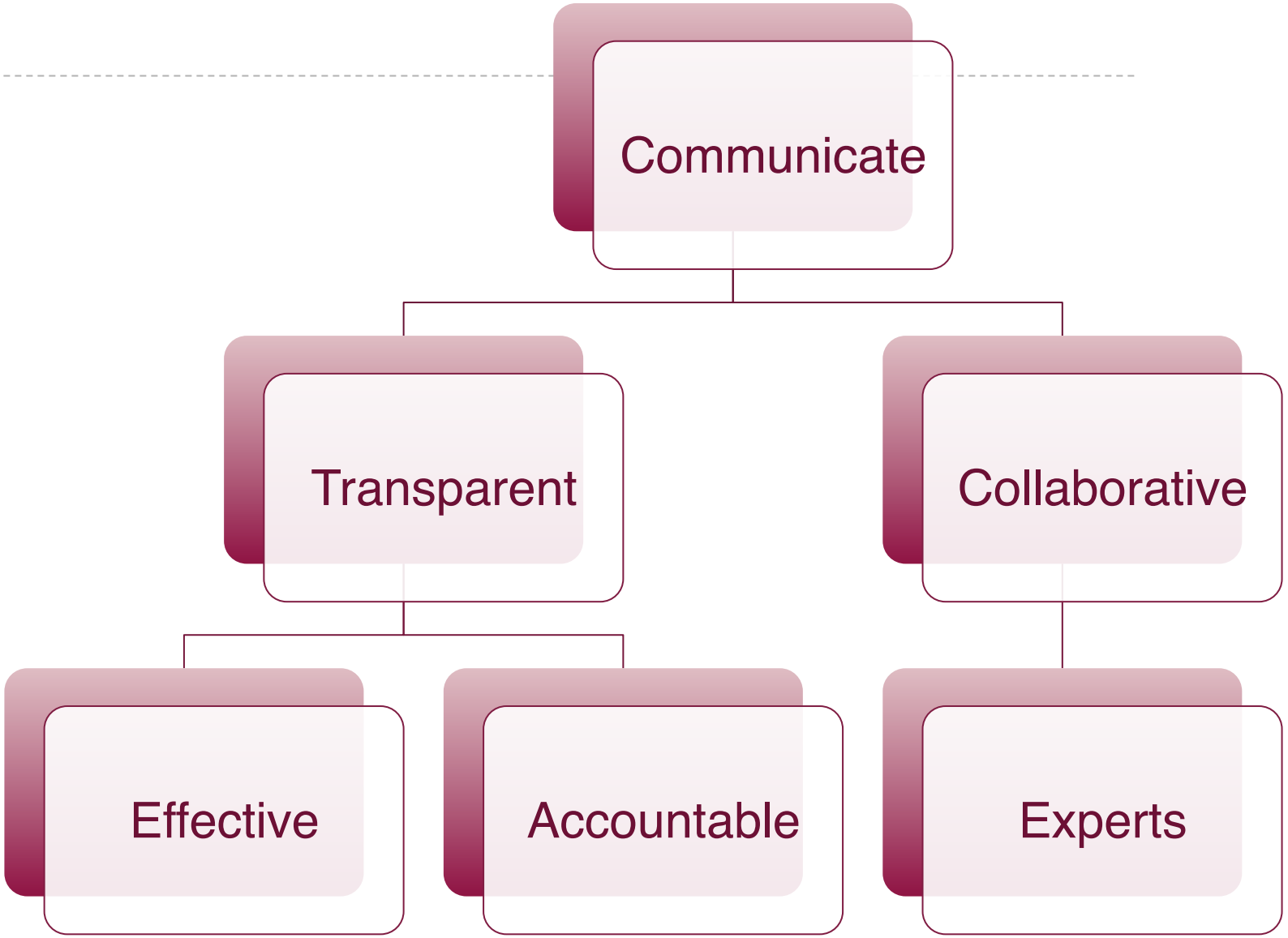
University of Delaware	Georgia Institute of Technology
Private Institution	Public Institution Part of USG
Land, Space and Sea Grant	2 Corporations as Contracting Entities
1600+ proposals submitted	3500+ proposals submitted
$200 million sponsored activity expenditures	$900 million sponsored activity expenditures
Oversight Pre-Award & Financial Post Award, Research Information Technologies	Oversight Pre-Award & Non Financial Post Award, Research Information Technologies
People Soft, CAYUSE	Oracle, CAYUSE, Workday Financials

Premier Research Institution

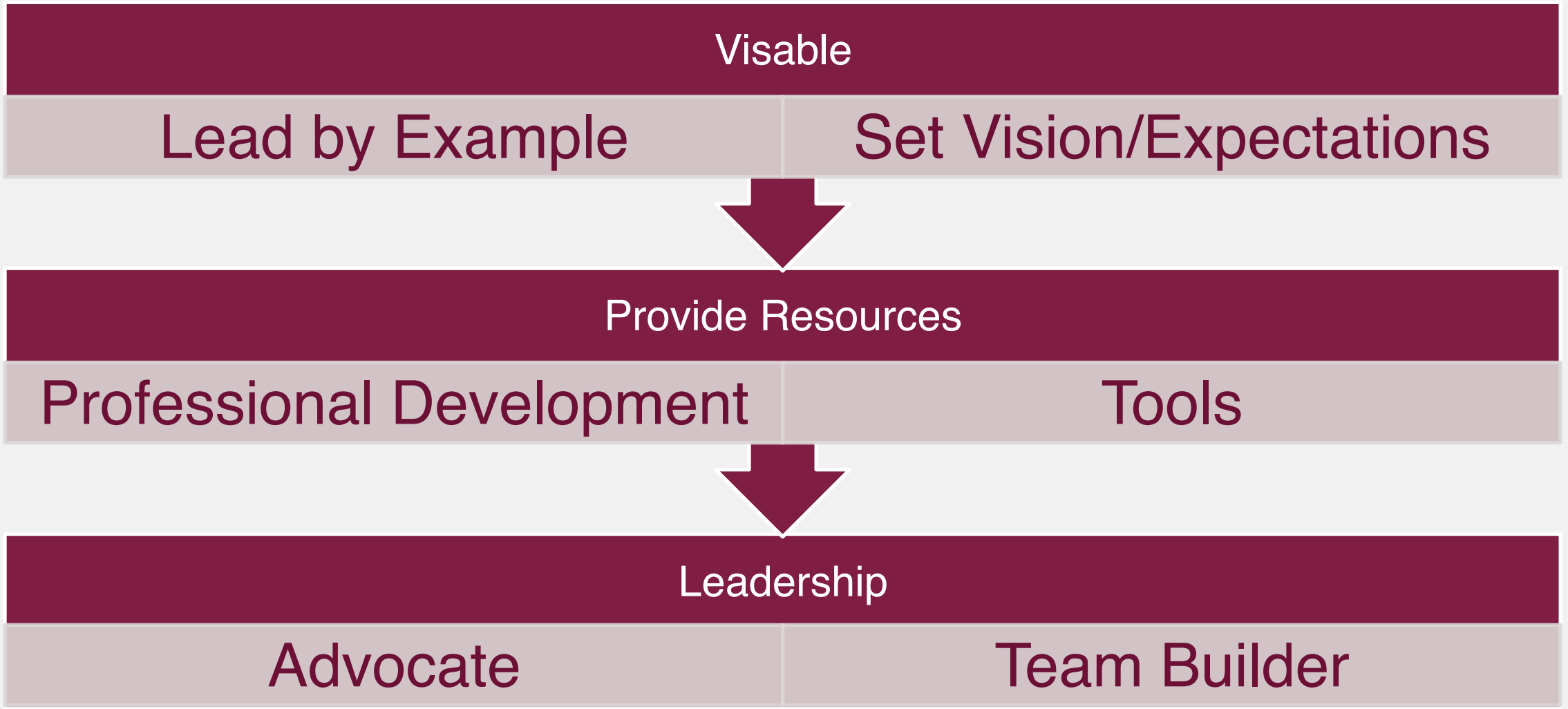
Office of Sponsored Programs Mission

To provide outstanding service to Virginia Tech faculty, researchers, staff and students in their pursuit and administration of external funding to support research, instruction and outreach activities

Effective Office of Sponsored Programs



Associate Vice President for Research & Innovation



OSP FUNCTIONAL ORG CHART

THERESA MAYER
VICE PRESIDENT FOR RESEARCH AND INNOVATION

TRUDY RILEY
ASSOCIATE VICE PRESIDENT FOR RESEARCH AND INNOVATION, SPONSORED PROGRAMS

Pre-Award

- Proposal budget support
- Review of Request For Proposal/Solicitations
- Proposal submission/ revisions

Contracts/ Agreements

- Accept grants/ cooperative agreements
- Negotiate contracts
- Sub-award processing

Post-Award

- Cash/Receivable Management
- Cost accounting review
- Invoicing/billing
- Financial reporting
- Closeout

Assurance/ Outreach

- Effort certification reporting (PARs)
- Cost transfer review
- Compliance monitoring
- Proposals/Awards Processing

Systems

- SUMMIT
  - Agreements Tracking
- Post Award Mgmt
  - 3 Phases
- Banner
  - Projections
  - Invoicing
  - Cash Mgmt
- Effort Certification
  - Electronic

Staff Structure

- Current Structure
  - Reviewing Teams
  - Contract Team
- Future Structure
  - Growth in departments
  - Faculty disciplines
- Engagement with Campus

Education/Training

- Faculty/PI
  - Dissemination of information
  - Raise awareness
- Staff
  - Update certifications
  - Communication of new and revised regulations